Lucas Busta

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Professional Preparation

2018- ... **NSF Postdoctoral Research Fellow** ..... University of Nebraska-Lincoln (UNL)
2016-18 **Postdoctoral Research Associate** ..... University of Nebraska-Lincoln (UNL)
2011-16 **Ph.D. Analytical Chemistry** ..... University of British Columbia (UBC)
2007-11 **B.Sc. Chem., Biochem. & Molecular Biology** ..... University of MN-Duluth (UMD)

Publications and Presentations

Peer-reviewed publications

in review [12] **Lucas Busta**, Won Cheol Yim, Evan LaBrant, Peng Wang, John Ohlrogge, Patricia Santos, Dylan Kosma, and Edgar B. Cahoon. "First steps on the pathway to bioactive polyacetylenic lipids of *Daucus carota*" *PLANT PHYSIOLOGY* ..... *I.F. 6.4*

2018 [11] Xiangjun Li, Alicen M. Teitgen, Asghar Shirani, Juan Ling, **Lucas Busta**, Rebecca E. Cahoon, Wei Zhang, Zaiyun Li, Kent D. Chapman, Diana Berman, Chunyu Zhang*, Robert E. Minto*, and Edgar B. Cahoon*. "Discontinuous Elongation Generates Novel Fatty Acid Hydroxylation and Seed Oil Functionality" *NATURE PLANTS*, *in press* ..... *I.F. 10.3*

2018 [10] Yanjun Guo, June Li, **Lucas Busta**, Reinhard Jetter*. "Coverage and composition of cuticular waxes on the fronds of the temperate ferns *Pteridium aquilinum*, *Cryptogramma crispa*, *Polypodium glycyrrhiza*, *Polystichum munitum* and *Gymnocarpium dryopteris*" *ANNALS OF BOTANY*, *in press* ..... *I.F. 4.0*

2018 [9] Ok Tae Kim, Yurry Um, Mei Lan Jin, Young Chang Kim, Kyong Hwan Bang, Daniela Hegebarth, **Lucas Busta**, Radu Racovita, Reinhard Jetter. "A Novel Multifunctional C-23 Oxidase, CYP714E19, is Involved in Asiaticoside Biosynthesis" *PLANT AND CELL PHYSIOLOGY*, *in press* ..... *I.F. 4.7*

2018 [8] Tongjun Sun, **Lucas Busta**, Pingtao Ding, Reinhard Jetter, and Yuelin Zhang*. "Arabidopsis Transcription factors TGA1 and TGA4 regulate salicylic acid and pipecolic acid biosynthesis by modulating the expression of *SARD1* and *CBP60g*." *NEW PHYTOLOGIST* 217: 344-354 ..... *I.F. 7.3*

2017 [7] **Lucas Busta** and Reinhard Jetter*. "Moving beyond the ubiquitous: the structural diversity and biosynthesis of specialty plant wax compounds" *PHYTOCHEMISTRY REVIEWS*, 1-30 ..... *I.F. 3.4*

2017 [6] Yanjun Guo†, **Lucas Busta**†, and Reinhard Jetter*. "Composition of cuticular wax differs among organs of *Taraxacum officinale*." *PLANT PHYSIOLOGY AND BIOCHEMISTRY*, 115: 372-379 ..... *I.F. 2.7*

2017 [5] **Lucas Busta*** and Reinhard Jetter. "The structure and biosynthesis of branched wax compounds on *Arabidopsis thaliana*." *PLANT AND CELL PHYSIOLOGY*, 58(6): 1059-1074 ..... *I.F. 4.7*

*corresponding author

2016 [4] **Lucas Busta**†, Daniela Hegebarth†, Edward Kroc, Reinhard Jetter*. "Changes in cuticular wax coverage and composition on developing Arabidopsis leaves are influenced by wax biosynthesis gene expression levels and trichome density." *PLANTA*, 245(2): 297-311 ..... *I.F. 3.3*

2016 [3] Pingtao Ding†, Dmitrij Rekhter†, Yuli Ding†, Kirstin Feussner, **Lucas Busta**, Sven Haroth, Shaohua Xu, Xin Li, Reinhard Jetter, Ivo Feussner, Yuelin Zhang*. "Systemic Acquired Resistance Deficient 4 encodes a key enzyme for pipecolic acid biosynthesis." *PLANT CELL*, 28(10): 2603-2615 ..... *I.F. 8.7*

2016 [2] **Lucas Busta**, Jessica M. Budke, Reinhard Jetter*. "Cuticular wax coverage on *Funaria hygrometrica* is similar to vascular plants, but wax composition differs between surfaces of the leafy gametophyte, calyptra, and sporophyte capsule." *ANNALS OF BOTANY*, 118(3): 511-22 ..... *I.F. 4.0*

2016 [1] **Lucas Busta**, Jessica M. Budke, Reinhard Jetter*. "Identification of β-hydroxy fatty acid esters and primary, secondary-alkanediol esters in cuticular waxes of the moss *Funaria hygrometrica*." *PHYTOCHEMISTRY*, 121: 38-49 ..... *I.F. 3.2*

Manuscripts in preparation

in prep [13] Gianfranco Diretto*, Sarah Frusciante, Claudia Fabbri, Nicolas Schauer, **Lucas Busta**, Zhonghua Wang, Alessia Fiore, Alisdair R. Fernie, Reinhard Jetter, Benedetta Mattei, James J. Giovannoni, and Giovanni Giuliano*. "A carotenoid/ABA regulatory loop controls tomato fruit ripening."

in prep [14] **Lucas Busta**, Reinhard Jetter, and Ulrike Bauer*, . "Fine-tuning of epicuticular wax crystal slipperiness in a carnivorous pitcher plant"

in prep [15] **Lucas Busta**†, Olga Serra†, Ok Tae Kim, Marisa Molinas, Irene Peré, Reinhard Jetter, Mercè Figueras. "Three oxidosqualene cyclases from *Quercus suber* involved in cork wax production."

Invited Oral Presentations

2018 **Lucas Busta** "Phytochemical structures and occurrence across plant diversity as a tool for biosynthetic pathway discovery." Departmental seminar, *DEPT. OF BIOCHEMISTRY, THE UNIVERSITY OF NEVADA - RENO*, Reno, NV. Host: Dylan Kosma

2017 **Lucas Busta** "Using R to construct and annotate phylogenetic trees." Guest seminar, *UNL DEPT. OF AGRONOMY AND HORTICULTURE R CLUB*, Lincoln, NE.

2017 **Lucas Busta** "Now is the most exciting time yet to be a (plant) scientist." NSF Outreach Program presentation, *THE UNIVERSITY OF NEBRASKA - LINCOLN*, Lincoln, NE.

2016 **Lucas Busta** "The diversity and biosynthesis of cuticular waxes." Special seminar, *THE BOYCE THOMPSON INSTITUTE*, Ithaca, NY. Host: James Giovannoni

2016 **Lucas Busta** "The diversity and biosynthesis of cuticular waxes." Special seminar, *THE CENTER FOR PLANT SCIENCE INNOVATION*, Lincoln, NE. Host: Edgar Cahoon

Oral Presentations

2018 **Lucas Busta**, Won Cheol Yim, Evan William LaBrant, Lindsey Grimes, Zach Wahrenburg, Peng Wang, Patricia Santos, Dylan K. Kosma, Edgar B. Cahoon: "The diversity, activity, and biosynthesis of bioactive polyacetylenes in *Daucus carota*", Oral Presentation, *BOTANICAL SOCIETY OF AMERICA*, Rochester, MN

†co-first authors
*corresponding author

2018 **Lucas Busta**, Won Cheol Yim, Evan William LaBrant, Lindsey Grimes, Zach Wahrenburg, Peng Wang, Patricia Santos, Dylan K. Kosma, Edgar B. Cahoon: "The diversity, activity, and biosynthesis of bioactive polyacetylenes in *Daucus carota*", Oral Presentation, *INTERDISCIPLINARY PLANT GROUP MEETING 2018*, Columbia, MO †

2017 **Lucas Busta** and Reinhard Jetter: "Digging for buried treasure in a chemical diversity database", Oral Presentation, *PHYTOCHEMICAL SOCIETY OF NORTH AMERICA*, Columbia, MO

2015 **Lucas Busta**, Jessica M. Budke, Reinhard Jetter: "Cuticular waxes from the leafy gametophyte, sporophyte, and calyptra of the moss *Funaria hygrometrica*", Oral Presentation, *BOTANICAL SOCIETY OF AMERICA*, Edmonton, AB

2013 **Lucas Busta**, Jessica M. Budke, Reinhard Jetter: "Hydroxy esters from the gametophyte, sporophyte, and calyptra of the moss *Funaria hygrometrica*", Oral Presentation, *PHYTOCHEMICAL SOCIETY OF NORTH AMERICA*, Corvallis, OR ‡

2011 **Lucas Busta**, Evan Anderson, John F. Evans: "Development of a Time Domain Reflectometry System for the Determination of Ice Formation on Road and Bridge Surfaces", Oral Presentation, *SPRING UNDERGRADUATE RESEARCH SYMPOSIUM*, University of Minnesota Duluth, Duluth, MN

Poster Presentations

2018 **Lucas Busta**: "Genes controlling wax biosynthesis in *Sorghum bicolor*: potential for improving crop performance and value", Poster, *PLANT GENOME RESEARCH PROGRAM AWARDEE MEETING*, Washington, DC

2018 Nancy Nguyen, Caleb Wehling, **Lucas Busta**, Edgar Cahoon, Wayne Reikhoff: "Defining the mechanism of action of plant-derived polyacetylene antifungal compounds", Poster, *UNL UCARE SYMPOSIUM*, Lincoln, NE

2017 **Lucas Busta**, Evan LaBrant, Lindsey Grimes, Patricia Santos, Dylan Kosma, Edgar Cahoon: "Bioactivity, structure, and biosynthesis of polyacetylenes", Poster, *PHYTOCHEMICAL SOCIETY OF NORTH AMERICA*, Columbia, MO ‡ §

2017 **Lucas Busta**, Evan LaBrant, Lindsey Grimes, Patricia Santos, Dylan Kosma, Edgar Cahoon: "Structure and biosynthesis of bioactive polyacetylenes", Poster, *NEBRASKA RESEARCH & INNOVATION CONFERENCE: PREDICTIVE CROP DESIGN: GENOME TO PHENOME*, Lincoln, NE

2017 **Lucas Busta**, Evan LaBrant, Lindsey Grimes, Patricia Santos, Dylan Kosma, Edgar Cahoon: "Structure and biosynthesis of bioactive polyacetylenes", Poster, *NEBRASKA SYMPOSIUM ON PLANT BREEDING*, Lincoln, NE

2016 **Lucas Busta**, Reinhard Jetter: "Structure and biosynthesis of branched cuticular wax compounds", Poster, *PHYTOCHEMICAL SOCIETY OF NORTH AMERICA*, Davis, CA

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†selected for oral presentation from among poster abstracts
‡awarded
§presented in Spanish

Awards and Funding

Fellowships and Grant Proposals

Active

2018-... **Genes controlling wax biosynthesis in *Sorghum bicolor*: potential for improving crop performance and value** ($207,000) ..... *NSF Postdoctoral Research Fellowship in Biology*

Honors and Awards

2018 **Center for Plant Science Innovation Travel Award**: ($500) ..... *UNL PSI*
2017 **Postdoc Science Slam Champion**: ($750) ..... *UNL*
2017 **ASPB Plantae Fellow** ..... *American Society of Plant Biologists*
2017 **F. & M. Loewus Travel Award**: ($200) ..... *Phytochemical Society of North America*
2017 **Best Postdoctoral Poster Award**: ($250) ..... *Phytochemical Society of North America*
2016 **F. & M. Loewus Travel Award**: ($200) ..... *Phytochemical Society of North America*
2015 **Graduate Student Travel Award**: ($500) ..... *UBC*
2013 **Best Oral Presentation Award**: ($250) ..... *Phytochemical Society of North America*
2011 **Casmir Ilenda Award for Outstanding Undergrad. Research** ..... *UMD*
2011 **F.B. Moore Academic and Leadership Award** ..... *UMD*
2010 **ACS Undergraduate Analytical Chemist of the Year** ..... *American Chemical Society*
2010 **Maguire Award for Most Promising Chemistry Student** ..... *UMD*
2009 **Maguire Award for Most Promising Chemistry Student** ..... *UMD*

Academic Service and Outreach

2018-... **Organizer** ..... *Lipid Journal Club, biweekly meetings, 10 members*
2018-... **Weekly Twitter blog** ..... *@PlantsRChemists: #PhytochemicalFriday. >600 followers*
2017-... **Seminar Speaker Host** ..... *Dr. Dylan Kosma at the UNL Biochemistry Seminar Series*
2016-... **Monthly plant chemistry blog** .. *Plants Are Chemists: blog for the lay reader. >4500 reads*
2016-... **Instrumental analysis Youtube channel** ... *A channel on instrument repair. >9000 views*

2018 **Volunteer** ..... *Investigate, Saturday Science program for kids, UNL Science Museum, 2 hrs.*
2017-18 **Volunteer** ..... *Plantae(.org) Outreach Network Coordinator*
2017 **Volunteer** ..... *Sunday with a Scientist, UNL Science Museum, 4 hrs.*
2017 **Volunteer** ..... *NSF High School Teacher Workshop, UNL, 4 hrs.*
2017 **Volunteer** ..... *NSF Outreach Day, UNL, 3 hrs.*
2017 **Volunteer** ..... *Fascination of Plants Day, UNL, 3 hrs.*
2017 **Volunteer** ..... *Women In Science, UNL, 3 hrs.*
2017 **Volunteer** ..... *Graduate Student Spring Poster Fair Judge, UNL, 3 hrs.*

2018-... **Member** ..... *America Society of Plant Biologists*
2018-... **Member** ..... *Botanical Society of America*
2017-... **Member** ..... *National Postdoctoral Association*
2013-... **Member** ..... *Phytochemical Society of North America*

2018-... **Ad hoc reviewer** ..... *Plant Physiology (I.F. 6.4)*
2018-... **Ad hoc reviewer** ..... *Plant Physiology and Biochemistry (I.F. 2.8)*
2018-... **Ad hoc reviewer** .. *UNL Undergraduate Research Program Applications (24 1.5-page apps.)*
2018-... **Ad hoc reviewer** ..... *Functional Plant Biology (I.F. 2.5)*
2018-... **Ad hoc reviewer** ..... *Lipids (I.F. 1.9)*
2018-... **Ad hoc reviewer** ..... *Horticulture Research (I.F. 4.2)*
2017-... **Ad hoc reviewer** ..... *Plant Cell Reports (I.F. 3.1)*

Research Training and Experience

Research Training

2018 **Phylotranscriptomics for non-model species** (Botany2018 conference) ..... *4 hrs*
2018 **NSF Broader Impacts Training** (National Alliance for Broader Impacts) ..... *6 hrs*
2018 **Workshop: "Preparing Postdocs to be Professors"** (UNL) ..... *1.5 hrs.*
2017 **Workshop on Emotional Intelligence in the Workplace** (UNL) ..... *8 hrs.*
2017 **Science Communication and Policy Bootcamp** (American Institute of Biol. Sci.) .. *7 hrs.*
2017 **Metabolomics Workshop** (UNL Center for Biotechnology and Waters) ..... *9 hrs.*
2017 **Social Media and Communicating Science Workshop** (UNL) ..... *2 hrs.*
2017 **Endangered Data: What is it and how can I help?** (UNL Library) ..... *2 hrs.*
2017 **Workshop on Budget Development** (UNL) ..... *2.5 hrs.*
2017 **Write Winning Grant Proposals Seminar** (UNL) ..... *7 hrs.*
2016 **Bioinformatics for Evolutionary Biology** (UBC Biology 525D) ..... *20 hrs.*
2016 **R Carpentry Workshop** (UBC) ..... *12 hrs.*
2012 **Physical and Analytical Chemistry Seminar** (UBC Chemistry 540A) ..... *24 hrs.*
2012 **Principles of Chemical Separation** (UBC Chemistry 534) ..... *72 hrs.*
2011 **Bioanalytical Chemistry** (UBC Chemistry 533) ..... *72 hrs.*
2011 **Advanced Bioorganic Chemistry** (UBC Chemistry 569) ..... *72 hrs*

Research Experience

Collaborative / Team Research

2018-... **Prof. Argelia Lorence** (Arkansas State U., USA)
2018-... **Asst. Prof. Hiroshi Maeda** (U. Wisconsin-Madison, USA)
2017-... **Asst. Prof. Dylan Kosma** (U. Nevada-Reno, USA) ..... [pub. 12]
2016-... **Prof. Yanjun Guo** (Southwest Agricultural U., China) ..... [pubs. 6, 10]
2015-... **Dr. Ulrike Bauer** (U. Bristol., U.K.) ..... [pub. 14]
2015-17 **Prof. Yuelin Zhang** (U. British Columbia., Canada) ..... [pubs. 3 & 7]
2012-... **Asst. Prof. Jessica Budke** (U. Tennessee.-Knoxville, USA) ..... [pubs. 1 & 2]

Postdoctoral Research

2016-... **Research area: *Biosynthesis of fatty acid-derived natural products***
mentor: Edgar Cahoon, Professor of Biochemistry, Center for Plant Science Innovation Director
- Performed *de novo* transcriptome assembly and differential expression analysis
- Constructed and expressed binary vectors in hairy roots, tobacco, arabidopsis, camelina
- Identified and quantified novel lipid metabolites in plant tissues

Doctoral Research

2011-16 **Research area: *Diversity and biosynthesis of plant cuticular waxes***
mentor: Reinhard Jetter, Professor of Chemistry and Botany
- Performed detailed chemical analyses of hundreds of plant cuticular lipid extracts
- Chemically synthesized standards for structure elucidation and enzyme assay
- Performed comprehensive lit. review and biosynthetic analysis of plant waxes

Undergraduate Research

2008-11 **Research area: *Custom data acquisition software design***
advisor: John Evans, Professor of Chemistry
- Developed custom data acquisition and processing software using LabVIEW

Teaching, Mentoring, & Course Development

Training in Education

2018 **Resume & Cover Letter Workshop** (UNL) . . . . . *2 hrs.*
2017 **Associate at Center for the Integration of Research, Teaching, and Learning** . . (CIRTL)
2016 **Instructional Skills Workshop** (UBC) . . . . . *24 hrs.*
2016 **Writing Across the Curriculum Workshops** (UBC) . . . . . *7 hrs.*

Teaching and Course Development Experience

Guest Lecturer

2018 **U. Nevada-Reno Biotech. 777: Biotechnology (graduate level)**
Lecture title: "Practical skills for graduate research" . . . . . *20 students, 50 min.*
2017 **UNL Biochemistry 435: Plant Biochemistry (graduate level)**
Lecture title: "The plant cuticle" . . . . . *12 students, 50 min.*
2017 **UNL Biochemistry 435: Plant Biochemistry**
Lecture title: "Membrane hemifusions" . . . . . *12 students, 50 min.*
2016 **UBC Chemistry 319: Practical Skills for Chemical Research**
Lecture title: "Things I wish I'd known before starting research" . . . . . *20 students, 30 min.*

Professional Online Tutor and Lecturer

2016-18 **Chemistry and Biology Tutor and Lecturer** (`oneclass.com`); invited to be an online tutor and lecturer on a undergraduate-level instructional platform. Position requires answering students' chemistry and biology questions 1-on-1 via written online interface and delivering lectures on chemistry and biology topics. . . . . *2.2 million student base*

Teaching Assistant

2016 **Analytical Chemistry Lecture** (UBC Chemistry 311) . . . . . *90 students, 1 semester*
2015 **Analytical Chemistry Lab** (UBC Chemistry 311) . . . . . *6–12 students, 1 semester*
2013-14 **Organic Chemistry Lab** (UBC Chemistry 235) . . . . . *15 students, 2 semesters*
2012-13 **Analytical Chemistry Lab** (UBC Chemistry 311) . . . . . *6–12 students, 2 semesters*
2011-12 **First Year Resource Centre** (UBC) . . . . . *5–10 students, 2 semesters*
2009-11 **Analytical Chemistry Lab** (UMD Chemistry 2223) . . . . . *20 students, 4 semesters*

Training in Mentoring

2018 **Mentoring and Advising Workshop** (CIRTL) . . . . . *2 hrs.*
2015 **Teaching Assistant Peer-Mentor Training** (UBC) . . . . . *6 hrs.*

Mentoring Experience

University of Nebraska

2018-... **Evan Updike**: Undergraduate collaborator . . . . . *3 months*
- Cloning: digests, PCR, ligation, Gibson assembly, bacterial transformation
- Heterologous expression: yeast, Arabidopsis, transgenic hairy roots

2017 **Evan LaBrant**: Rotating PhD student in Plant Biochemistry . . . . . *3 months*
- Chemical separation, structural and quantitative analysis by GC-MS . . . . . [pub 12]

subsequently: PhD student, Roston Lab, UNL

University of British Columbia

2016 **Cassie McDonald**: Undergraduate collaborator . . . . . *5 months*
- Quantitative analysis of surface lipids by GC-MS and GC-FID

subsequently: Master's program in Genetic Counseling, UBC

2016 **Yabin Guo**: First year teaching assistant . . . . . *5 months*
- Assisting with upper-level chemistry laboratory courses

2016 **Kaylyn Leung**: First year teaching assistant . . . . . *5 months*
- Assisting with upper-level chemistry laboratory courses

Skill Sets

Analytical and Organic Chemistry

Chemical Analysis

GC-EI-MS, GC-FID: Expert .... *Quantitative lipid and amino acid profiling, structure elucidation*
LC-ESI-MS(/MS): Intermediate ..... *Quantitative lipid analysis*

Organic Synthesis

Functionalized lipids: Intermediate ..... *Basic reactions, work-ups, and product purification*

Biochemistry and Molecular Biology

Plant Molecular Biology

Vector construction (Gibson Assembly, T4): Intermediate ..... *1-2 gene overexpression vectors*
Heterologous expression: Intermediate ..... *A. thaliana, Camelina, hairy roots, N. benth., yeast*
Plant crossing: Intermediate ..... *Arabidopsis thaliana*

Computational Biology and Computers

Chemical and Biological Informatics

R scripting: Expert ..... *Chemical and biological informatics, technical graphics, phylogenetics*
perl scripting: Advanced ..... *Statistical computing, bioinformatics*
bash scripting: Advanced ..... *Statistical computing, bioinformatics*
informatics programs: (trinity, rsem, etc.) Intermediate .. *Transcriptome assembly and analysis*

Computer languages and programs

Github, HTML, CSS: Advanced ..... *Website design, R package version management*
Wordpress: Advanced ..... *Website design*
LabVIEW: Advanced ..... *Custom data acquisition and processing*
LaTeX: Advanced ..... *Professional typesetting and document generation*
Mendeley: Advanced ..... *Reference collection and management*
Javascript (D3 libraries): Intermediate ..... *Interactive visualization of complex datasets*
pymol: Intermediate ..... *3D protein structure visualization*

Tools Developed

phylochemistry: An R package for analyses of enzymatic reactions and chemical diversity in the context of phylogeny .....`github.com/LucasBusta/phylochemistry`

TREES in R: An R script tutorial for constructing and annotating phylogenetic trees in R `lucasbusta.github.io/resources/TreesInR.R`

Elemental: A perl script for managing high-quality *de novo* transcriptome assembly using multiple existing assemblers in parallel (based on the method of Voshall et al.), BLASTing transcriptomes and acquiring public sequence data to analyze and visualize gene homology and expression patterns .....`lucasbusta.github.io/resources/elemental.pl`

Spoken Languages

2001-... **Fluent in Spanish (Castellano)** reading, writing, speaking